TESTIMONY

PIKE POWERS

U.S. House Committee on Science
Hearing on –
INNOVATION AND INFORMATION TECHNOLOGY:
THE GOVERNMENT, UNIVERSITY, AND INDUSTRY ROLES IN
INFORMATION TECHNOLOGY RESEARCH AND COMMERCIALIZATION
Friday 05 May 2006 @ 2:00pm, Austin, TX

Many of the witnesses – myself included – who are testifying in these hearings will refer to Tom Friedman's incisive book, *"The World is Flat"* or the recent report by the National Academies, *"Rising Above the Gathering Storm."* Along with the previous work by your committee Mr. Chairman, you have seen a great deal of material and have received a host of thoughtful recommendations. I ask your indulgence to add to that pile just a little bit.

Perhaps another study should be added to the record. Earlier this week, National Geographic, in conjunction with Roper Public Affairs, released their 2006 survey of 18-24 year old young American adults. Some of the more salient results are stunning:

- 63% could not find Iraq or Saudi Arabia on a map of the Middle East;
- 37% could not identify Louisiana, 48% could not find Mississippi, 50% failed to pinpoint New York State;
- only 35% correctly choose Pakistan from 4 possible choices as the country hit by a catastrophic earthquake in October 2005;
- only 18% know that Mandarin Chinese is the most widely spoken native language in the world;
- when asked which of 4 countries has a majority of Muslim residents, only 25% correctly identified Indonesia.

By the way, these interviews lasted an average of 27 minutes each! As National Geographic said in the executive summary accompanying the study, "Taken together, these results suggest that young people in the United States are unprepared for an increasingly global future."

If I may be permitted a slight variation of astronaut James Lovell's famous quote during the Apollo XIII mission, "America, we have a problem." If this topical study is any indication of the state and quality of American education, then yes, we have a problem.

Mr. Chairman, among the questions you asked us to address deals with "what areas of research and what type of programs should government support to maintain U.S. competitiveness?" While the Science Committee is focused on innovation and commercialization, there is a clear message here for the Congress and the whole country that we must do a better job in education – all across the board.

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The Chancellor of the University of Texas System, Mark Yudof, recently convened a panel of business and community leaders to address how Texas and its research universities can best

optimize research and technology transfer. Among the comments he heard were a number of observations based on the hard-earned experience of business people not directly involved in the awesome task of running our nation's outstanding research universities. These comments have very likely been heard at similar discussions around the country.

- ❑ Royalty and license income is very much below what it can be for these universities;
- ❑ Industry says that working with the university community is difficult, to say the least;
- ❑ Universities do not do an adequate job of what can be called "internal prospecting;"
- ❑ Early-stage seed, angel, and venture capital funding has essentially disappeared and detached from university-based commercialization;
- ❑ No one is addressing the full spectrum of what it takes to commercialize new technology;
- ❑ Universities do not have a good handle on the metrics of successful technology transfer;
- ❑ There is a strong need for universities to have a rallying point for better and more lasting connection with the capital community;
- ❑ Too many research universities have not constructed viable reward systems for innovative faculty.

From my own experience working with and listening to a great many presidents and chancellors of research universities, I believe it is fair to say they realize the great, inherent value of successfully commercializing new technology coming out of their research establishments. It's of great value to their mission of teaching and education – of great value to our students and to excellence within faculties, and – of great value to local, regional, and national economies.

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Last summer, Karin Rivard, assistant director and counsel for MIT's Technology Licensing Office gave a brilliant and clear-headed presentation on the commercialization of university technology.

Some of the myths that academia, the government, and the public will have to come to terms with include:

- o Royalties are already a significant source of revenue for universities;
- o Expect a quick return on technology transfer investment by the universities;
- o Companies are eager to accept new technologies from universities;
- o One should simply broadcast the availability of technology for licensing.

She concludes that the primary objective is successful technology transfer, not solely the larger goals of maximizing income.

I endorse her insights. We must keep our eye on the ball before us. What all the principal players are after – whether it's academia, the government, business, or the capital investment community – is to find those jewels of research that are mature enough and with clear advantages – and then to help successfully move them from the lab to the marketplace.

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One of the key goals of your committee is to examine new ways in which "government investment in research that promotes innovation and fosters the development and

commercialization of new applications" can help not only the economic vitality of this country, but that also meaningfully contributes to a healthier set of global relationships.

I know that your committee has looked closely at the advisability of the Congress establishing an ARPA-like agency within the Department of Energy. I know your committee has taken a keen interest in the nation paying greater attention devoted to enhancing science and math education in the U.S. And, I also know that the committee had a significant role in helping develop the President's "American Competitiveness Initiative (the ACI)."

From my vantage point of an active career in the law, in economic development, in supporting government's role in innovation, and in community affairs, I urge you and your colleagues in both bodies and on both sides of the aisle to commit meaningful investment in the principal tenets of the ACI:

- Doubling the Federal commitment to the most critical basic research programs in the physical sciences over the next 10 years;
- Encouraging the expansion of a favorable environment for additional private-sector investment in innovation;
- Improving the quality of education to provide American children with a strong foundation in math and science;
- Supporting universities that provide world-class education and research opportunities;
- Providing job training that affords more workers and manufacturers the opportunity to improve their skills and better compete in the 21st century;
- Attracting and retaining the best and brightest to enhance entrepreneurship, competitiveness, and job creation in America by supporting comprehensive immigration reform; and
- Fostering a business environment that encourages entrepreneurship and protects intellectual property.

I would encourage the committee – working in conjunction with your colleagues in appropriations and on other relevant committees – to work for and support those federal programs that strengthen multi-disciplinary, multi-state development efforts and help bring universities, small companies, and large companies together to develop new technologies needed for future US growth and competitiveness. Let me recommend four examples such as the very successful Partners for Innovation (PFI) program within the National Science Foundation, the various centers within the Rural Policy Research Institute (RUPRI) funded in part by the Department of Agriculture, programs at the Department of Commerce such as the Economic Development Administration, the Advanced Technology Program (ATP) at the National Institute of Standards and Technology (NIST).

I know the Advanced Technology Program has sometimes been controversial, but that dates from the politics of the 1990s. In the post-9/11 environment, and with the striking emergence of China and India into the global economy, we are in a very different world, a world in which we need every tool we have. The good news is that ATP is a proven tool. Under the leadership of Intel's Gordon Moore, the National Academies of Science reviewed the operation of the ATP. Their report, The Advanced Technology Program: Assessing Outcomes, concluded that the program works. The National Academies found that ATP is meeting its legislative goals and is

making possible advances in fuel cells, breast cancer diagnostics, and nanotechnology that will enhance the future welfare and wealth of the American people.

As discussions go ahead on what we might do to set up new institutions to develop new energy technologies, we should not abandon programs that are already working. Accordingly, the ATP budget should be restored and I would suggest that the program be tasked with doing work for other agencies to help accelerated the transfer of university and laboratory technologies into the marketplace.

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I was greatly encouraged by your committee's hearing last October on the National Academies' report entitled: *"Rising Above the Gathering Storm."* The chairman of that study, Norm Augustine, distinguished retired chairman and CEO of Lockheed Martin, provided his committee's summary of where things now stand – quite apart from all the shortcomings that have been identified.

He said, "the enigma is that in spite of all these factors, America seems to be doing quite well just now. Our nation has the highest R&D investment intensity in the world. We have indisputably the finest research universities in the world. California alone has more venture capital than any nation in the world other than the US. Two million jobs were created in America in the last year alone, and citizens of other nations continue to invest their savings in America at a remarkable rate." He concluded, "Total household net worth (in the US) is now approaching $50 trillion."

Specific answers to your questions, as posed, are as follows:

1 - How does government investment in information technology research promote innovation in IT and foster the development and commercialization of new applications?

Government investment in IT research, either at the early research stage (e.g. 10 years out) or at the commercialization stage (2 years out), is important. However, since companies can rarely fund high-risk, visionary research, it is most important that the government provide support for that basic research either in universities or in government research labs.

Fund challenge grants that are targeted on high priority needs of U.S. economy (e.g. Alternative Energy Initiative and Healthcare Policy).

2 - What role does university research play in innovation in information technology?

Most industry-based research focuses on near-term (1 to 5 years out) technical challenges related to their existing product line and/or economic niche. (This is often called "applied research" or "development".) In contrast, universities, for the most part, focus on IT challenges that are ten or more years away from commercialization. (This type of research is often defined as "basic research".) Because of this freedom to explore ideas in new, uncharted territory, university research can identify completely new software or hardware IT principles that can open the possibilities for new economic sectors based on new IT products.

Hence, university-based research is exceedingly important as an engine for commercialization of products that will impact the economy a decade or more in the future. It is this futuristic research, or basic research, in the universities that spawns the new companies of tomorrow.

Prioritize research that leads to convergence between IT-, nano- and bio-science.

3 - How do companies balance support for research conducted within the company and research performed at universities?

Companies, if they support research at universities, typically support applied research that addresses relatively near-term challenges that can be uniquely solved by a university due to the university's specialized capabilities. In the U.S., both our companies and our universities have different niche capabilities. It is the universities that are focused on applied research that have the best alignment between their capabilities and a company's applied research needs.

Peer review raw laboratory science for its market viability.

"Open Innovation" between investigators and other public, private research labs.

Create additional tax incentives for private sector R&D investment, especially alongside university research.

4 - What are the barriers to use of university results in commercialization of new information technology products?

To me, the biggest barrier is that the U.S. does not have sufficient investment funds (either public or private) to take the university research results that are typically at the theoretical or conceptual stage to a "proof of concept" and prototype product stage. Private funding from venture capital or existing companies is easy to obtain at the prototype stage. However, our country is short on support of the middle stage where the theoretical/conceptual ideas of a university are turned into prototypes. Often called the "Valley of Death", this is where federal innovation award programs like SBIR and ATP provide a much needed bridge across the valley. The interesting thing is that the awards not only provide capital at a critical phase in the development of new technologies, the awards also attract private sector investment, what some analysts have called a "halo" effect, meaning that a company that has a technology that can win a competitive award may well be worth private sector investment as well.

As noted, it is very important that we augment our investments in physics and chemistry and other disciplines, but at the same time, we need to ensure that the innovation chain remains unbroken, with the necessary incentives provided to bring the results of that research forward into the market. Other countries have recognized the strengths of programs like ATP and SBIR. Many of them are in fact emulating these programs or, like Finland and Taiwan, already have similar programs, often with proportionally greater funding.

I recommend that the U.S. create a mechanism to fund early-stage "hardening" of raw university technology.

As you and your committee well know, Norm Augustine's National Academies' committee made four broad recommendations as the basis of a "prosperity initiative" which included 20 specific actions required to make those broad recommendations a reality. If the Congress and this nation is committed to innovation and to international leadership, each of these 20 recommendations must be adopted and supported.

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Ron Kessler, my business partner, and I (Powers & Kessler L.L.C.) have developed, with the Big 12 Athletic Conference,

Baylor University

University of Colorado

Iowa State University

The University of Kansas

Kansas State University

University of Missouri – Columbia

University of Nebraska – Lincoln

The University of Oklahoma

Oklahoma State University

The University of Texas at Austin

Texas A&M University

Texas Tech University

the Center for Economic Development Innovation and Commercialization (or CEDIC for short). During the concept-validation phase of our work over the past 18 months, we have worked closely with each university president and chancellor, with all the provosts and vice presidents for research, with the deans of each of the major colleges, and with a very large number of key individual faculty investigators. We have received well over 400 extensive briefings on R&D activities throughout the 7-state region of the conference.

We have heard university leadership say they need help—lost of help. In a globalizing marketplace, the commercialization business tends to be rather parochial. We have seen first-rate R&D. These 12 universities currently are conducting in excess of $3 billion R&D activities from all funding sources. There are jewels within these research establishments that have been intensively developed and have demonstrated both technical and market merit.

The purpose of the Big XII CEDIC is to expand, foster, and facilitate the processes of commercialization, innovation, entrepreneurship, research collaboration, and technology transfer activities from the member universities to the private sector where appropriate. CEDIC will connect identified programs to the private sector. CEDIC contemplates generation of additional financial and intellectual resources for the universities and the stimulation of the larger economic community. CEDIC will serve as the key focal point by providing improved access to knowledge capital, leadership capital, and financial capital on behalf of the twelve member universities.

We fully realize and appreciate that successfully commercializing new products and technology is not as simple as perhaps I have made it sound. It requires both specialized skills not normally in abundance within academia, as well as an understanding of the limits of academic research and the rigors of the marketplace. It also requires a deep working knowledge of the capital community as well as the models of successful companies throughout the broad spectrum of commerce.

CEDIC is an innovative and novel approach.

At the end of the day, gap-bridging organizations – like CEDIC – have to know, understand, and work with the very different cultures of academia and commerce. These activities are very difficult, and not for the risk-averse.

While CEDIC faces the same challenges as do the investment and capital communities, its spectrum is considerably larger and much more complex. Typically, investors specialize in certain industries, types of deals, and stages of development. CEDIC's charter is more broadly addressed to a much larger gamut of possibilities. CEDIC is vigorously–

- about connecting, not just throwing some folks together;
- about thinking regionally;
- about relationships, not just "good ideas;"
- about technical competency, by the right members of expert panels covering all the right areas of science and engineering;
- about financial support for competent groups like CEDIC to successfully fill the gap between university research and commercialization;
- about university leadership realizing that their paradigms have dramatically changed, and a conscious decision to turn to industry to come alongside them in areas where academia can benefit from outside help;
- about multiple strategies to bridge the gap between university lab-to-market technology;
- about increasing university IP revenue;
- about business-as-usual no longer being the usual. New types of organizations – like CEDIC – bring to the table unique skills which, when combined with new approaches by university leadership, have the best chance to produce successful commercialization and technology transfer of university research. Everyone benefits – inventors, faculty, students, universities, business, government, consumers and customers, and the economy.

In closing, I would underscore the testimony of Dr. Randy Goodall by emphasizing:

1 - The semiconductor industry has created a collaborative model/platform for research, development, and commercialization, consisting of a well-defined pipeline and roadmap -- that is needed/can be used by the whole IT sector (communications, software, elec. systems, semiconductors).

2 - The need to understand and plan for the convergence of technologies - necessary to be able to afford costly R&D.

3 - The importance of awareness and adoption/use of the model (pipeline, roadmap, etc.) in emerging, nascent technologies.

4 - The importance of preserving and capitalizing on our relative strengths/resources as innovation engine, technology developers. Don't let what we have slip away.